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COMMUNICATIONS

THE SULPHONAMIDES IN EXPERIMENTAL OCULAR INFECTIONS

BY

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LONDON

1.—General Considerations

EXPERIMENTAL studies on the value of the sulphonamides in ocular infections raise a series of distinct problems. In the first place the relative specificity of the sulphonamides against a limited group of organisms imposes the task of establishing the value of these drugs against the organisms commonly seen in ocular infections. *In vitro* experiments give some indication, but results obtained by this approach are not necessarily applicable clinically. *In vivo* experiments to extend these test-tube findings present the first difficulty that confronts the ophthalmologist, for most of the organisms commonly seen in ocular infections do not give clear-cut lesions in the experimental animal. In fact the only classical experimental corneal lesion that can be induced in the rabbit is from inoculation with B. pyocyaneus, though there is now evidence that certain strains of staphylococcus aureus introduced beneath the corneal epithelium may also be effective (Robson and Scott, 1943). There is less difficulty in inducing intra-ocular infection, for many organisms introduced into the anterior

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chamber or vitreous give a ready result. None the less, the experimental study of ocular infection, and especially corneal infection, is severely limited owing to the absence of suitable techniques for producing experimental lesions. It is for this reason that studies on the value of the sulphonamides in corneal infection are confined almost entirely to lesions produced by Bacillus pyocyaneus, though clinically this is a rare occurrence.

The other ophthalmological problems in studies on the value of the sulphonamides centre around the question of concentration reached in the eye by the administration of these drugs. Not all medications pass through the blood-aqueous barrier, as is well known from the failure of the arsphenamides to reach the eye. In determining the permeability of the eye to the sulphonamides in the bloodstream, comparative studies have therefore to be carried out with the various sulphonamides not only to establish their relative capacity to penetrate into the eye, but also their rate of excretion from the eye, for the maintenance of an adequate level of concentration of these drugs for a prolonged period is an essential therapeutic requirement. The possibility of reaching adequate therapeutic levels of concentration by the local application of these drugs also calls for attention. This involves in the first place a study of the relative tolerance of the eye to the various sulphonamides when applied locally and the relative capacity of the eye to absorb these drugs. Finally, *in vivo* experiments have to establish which of the various sulphonamides are most effective for such experimental lesions as can be produced, and whether the general or the local administration of such drugs is the more effective.

No systematic survey covering all these problems has as yet appeared, but valuable studies have been recorded by a number of observers on various aspects of these inter-related problems. By far the greatest number of these studies are concerned with the tolerance of the eye to the various sulphonamides and the relative concentrations that the different sulphonamides reach in the ocular tissues, when these drugs are administered locally or by mouth. Elsewhere (Sorsby, 1942) a survey of this literature has been given, and here it is only necessary to bring out the following salient features:—

(1) Sulphanilamide is well tolerated by the eye when instilled into the conjunctival sac or introduced into the anterior chamber in saturated solution (0.8 per cent.). Sulphanilamide ointment 5 per cent. is also well tolerated when introduced into the conjunctival sac, and insufflation of sulphanilamide powder does not appear to be deleterious.

(2) The various sulphonamides are not equally effective in penetrating into the eye from the bloodstream. Generally speaking

the aqueous level of sulphanilamide and sulphapyridine are about two-thirds of the blood level, that of sulphadiazine one half, and that of sulphathiazole one fifth.

(3) On local administration of sulphanilamide solution the levels of concentration in the aqueous are considerably lower than that obtainable by oral administration, and even such levels are not readily maintained owing to the great diffusibility of these drugs, but levels very much in excess of those reached by oral administration are obtained by the insufflation of sulphanilamide powder into the conjunctival sac. Sulphanilamide ointment (5 per cent.) in a suitable base and the soluble sulphanilamide preparation, sodium sulphacetamide, also gives a higher aqueous concentration than is obtainable by oral administration, whilst the corneal concentration level is exceptionally high. It is difficult to obtain high aqueous concentrations from a local administration of sulphapyridine, sulphathiazole and sulphadiazine. Such clinical data as are available show that the local absorption of sulphanilamide is rather bizarre.

It thus appears that higher aqueous levels and considerably higher corneal levels can be reached with various non-irritating local applications than by oral administration of the sulphonamides. If the level of concentration of the sulphonamides is the determining factor in the treatment of an infection, local treatment of corneal and intra-ocular infection is preferable—on *a priori* grounds—to general treatment, not only because of its avoidance of symptoms of drug intoxication, but also because of the opportunity it offers of reaching levels of concentrations locally that could not be obtained by general administration.

2.—Experimental Control of Corneal and Intra-ocular Infection

REVIEW OF LITERATURE

Only a few studies on the value of the sulphonamides in ocular infections are available. *In vitro* studies by Joy (1942) on four different strains of B. pyocyaneus showed both sulphanilamide and sulphapyridine ineffective against one particular strain; the two drugs were equally effective against one other strain; and for the two remaining strains sulphapyridine was superior to sulphonilamide.

1. EFFICACY OF GENERAL ADMINISTRATION.

(*a*) *Streptococcus haemolyticus*.—Streptococci (1:1000 dilution of a 24-hour culture in peptone and horse serum, the resulting suspension containing about 5 organisms in each high-power field) injected in quantities of 0.05 c.c. into the anterior chamber of [? three] rabbits produced an infection which in control animals

led to the loss of the eye, but in rabbits treated with sulphanilamide was readily overcome. Infection of the vitreous was not so well controlled. If sulphanilamide was given 24 hours before the inoculation experiments, the anterior chamber showed no reaction and the vitreous infection was milder. The vitreous reaction could be made to increase or decline by withholding or increasing the dose of sulphanilamide. When fully developed infection is present sulphanilamide has no effect (Rambo, 1938).

The time-factor in the administration of sulphanilamide and the quantity of infecting material are stressed by Venco (1939), who also found sulphanilamide protective in rabbit experiments.

(*b*) *B. pyocyaneus*.—Joy (1940 and 1942) carried out an extensive investigation on the value of sulphapyridine in B. pyocyaneus inoculation in the cornea of rabbits (the right cornea of 64 rabbits and both corneae of 110 rabbits were used). His results varied with the time when treatment was instituted. When sulphapyridine was given prophylactically (two doses in 24 hours) infection was not prevented, but its course was materially influenced. In such cases if treatment is continued for 24 hours inflammation rapidly subsides, though viable organisms still remain, as is seen from the fact that in 70 per cent. of cases relapse occurs, and this incidence is reduced to 7 per cent. if treatment is prolonged beyond 24 hours. Treatment instituted concurrently with inoculation was probably as effective as prophylactic treatment, whilst the results obtained with treatment instituted after six hours were distinctly better than those obtained with treatment begun after 18 hours, though these, too, compared favourably with the lesions seen in the untreated control eyes. Joy also noted that the concentration of the drug in the blood proved extremely variable both in different rabbits and in the same animal on different days; in general there was no relation between the concentration and the course and end result.

v. Sallmann (1942) administered sulphadiazine (0.2 g/K for 1-3 days) to 9 rabbits 18 hours after inoculation. In seven the infection was not controlled, and in the remaining two it was checked only temporarily; ultimately hypopyon developed.

2. EFFICACY OF LOCAL TREATMENT.

(a) *Streptococcus haemalyticus*.—Rambo (1938) studied the effect of sulphanilamide injected into the anterior chamber or vitreous simultaneously with a suspension of streptococci. In three out of four eyes in which 0.02 gm. of sulphanilamide in suspension was introduced into the anterior chamber the organisms produced no reaction; in the fourth eye infection was delayed for 5 days. In contrast no control of infection beyond delay in the development of the process could be obtained by the

simultaneous injection of infecting organisms and sulphanilamide into the vitreous. That the control of the anterior chamber infection was due to the local action of the sulphanilamide was shown by the fact that the fellow eye in the animals in which the process was controlled succumbed to infection within 48 hours, these eyes having been inoculated with streptococci in the anterior chamber, but having received no sulphanilamide.

(*b*) *Bacillus Pyocyaneus.*—Robson and Scott (1942) studied the effect of 30 per cent. sodium sulphacetamide solution on corneal inoculation of B. pyocyaneus, initiating treatment in one series of 17 eyes one hour after inoculation, and in two other series of 12 eyes, after 5 hours and 12 hours respectively. Corneal ulceration was completely prevented in 11 out of the 17 eyes in the first series, but only in 5 out of 12 and 2 out of 12 in the second and third series.

Boyd (1942) having shown that the concentration of sulphathiazole in the cornea and aqueous is increased by iontophoresis, v. Sallmann (1942) applied this technique to the treatment of experimental B. pyocyaneus infection of the cornea, using sulphadiazine since the highest local concentration could be obtained with this drug. In one series of 7 rabbits treated by sulphadiazine iontophoresis 8 to 18 hours after infection, keratitis was checked in more than half of the eyes; in the rest there was only a delay in the course of infection. In a second series of 9 rabbits results were more satisfactory; iontophoresis in one eye was initiated 18 hours after inoculation and was combined with feeding. Feeding was helpful, but not curative in itself, as the keratitis of the control eye showed. In a third series of 12 rabbits local treatment with sulphadiazine powder, though occasionally giving surprisingly good results, proved inferior to sulphadiazine iontophoresis alone, or combination with oral sulphadiazine. Three preliminary experiments also suggested a slight superiority of sulphadiazine iontophoresis to local application of 30 per cent. solution of sodium sulphacetamide in corneal lesions of 24 hours standing. The most favourable results in lesions 24 to 30 hours old was obtained from a combination of iontophoresis with powder locally or by mouth.

(*c*) *Staphylococcus aureus.*—Robson and Scott (1943), working with a particular strain of staphylococcus aureus, obtained characteristic corneal lesions in the rabbit when the organisms were introduced into the cornea beneath the epithelium. Though the lesions varied from animal to animal, the two eyes of the same animal showed remarkably similar pictures, thus enabling them to study the effect of local medications by applying these to one eye only and using the other eye as a control. They found that

10 per cent. of sodium sulphacetamide was as effective as 30 per cent. and 2½ per cent. solution was ineffective. In 27 rabbits all control eyes were affected, 21 of these being more or less heavily involved, whilst in the 27 treated eyes three were completely controlled and 17 but slightly affected, 7 eyes only having the same degree of involvement as the 21 control eyes. These results applied to those rabbits in which treatment was instituted 1 hour after inoculation and continued hourly for at least 48 hours. In none of the 6 animals in whom treatment was begun 24 hours after inoculation was the infection controlled. A solution of solubilized sulphathiazole did not appear promising. One point of interest was that though 10 per cent. solution of sodium sulphacetamide was effective in controlling the corneal infection there was no appreciable reduction in the number of staphylococci in the conjunctival sac, whilst pencillin (which also controlled the corneal infection) rendered the conjunctival sac free from staphylococci.

3.—Present Investigations

The object of the studies recorded here was to determine in the first place the efficacy of the sulphonamides in the local treatment of ocular infections and to assess its relative value to general administration of these drugs. For reasons already indicated, the bulk of the work concerned corneal infection with B. pyocyaneus and inoculation of streptococci and pneumococci into the anterior chamber. Rabbits were used throughout.

METHODS OF INFECTION :—

(a) *Corneal infection with B. pyocyaneus.*—Rich green 24 hours cultures of the organism on agar were used. As many colonies as possible were removed with a platinum loop and transferred to 2 c.c. of sterile normal saline solution, with which they were thoroughly mixed. This formed the infecting material. The rabbits' corneae were prepared by applying 2 per cent. butyn drops or ointment, and after 3 minutes the epithelium of the centre of the cornea could easily be scraped off with a discission needle. The bared area was then treated with the prepared infecting material applied by means of a platinum loop.

(*b*) *Anterior chamber inoculation with streptococci and pneumococci.*—The infecting material used was a 24 hours broth culture, diluted to 1 in 10,000. The rabbits' corneae were anaesthetized as for corneal inoculation. The infecting material (1/10 or 1/20 c.c.) was introduced into the anterior chamber by means of a finely graduated 1 c.c. syringe with a fine, sharp needle. Puncture at the limbus proved unsatisfactory; the needle had to be introduced

subconjunctivally 1 cm. away from the limbus. With care the iris could be avoided and the inoculation performed painlessly.

It will be noted that these experiments are not completely controlled in technique. The amount of corneal damage done in scraping off the epithelium probably varied to some extent, whilst the number and virulence of the organisms were not established. For these reasons control animals were used liberally.

A. CORNEAL INFECTION WITH B. PYOCYANEUS. (Table I.)

1. *The effect of 30 per cent. sodium sulphacetamide solution.*—(*a*) Six rabbits had both corneae infected with B. pyocyaneus. Treatment was instituted 24 hours later and consisted of the instillation of 30 per cent. sodium sulphacetamide drops three times a day for 7 days to the right eye only, the left being used for control. Though the reaction of the corneae varied to some extent—the lesion produced by the infection ranging from a mild corneal ulcer to destruction of the cornea leading to marked ectasia, but generally consisting of a massive infected ulcer—no tangible difference could be seen as between the treated and untreated eyes.

(*b*) A further 8 rabbits were similarly used, but treatment commenced immediately after infecting the cornea. The left (control) eyes were treated with saline drops. Again no tangible difference between the treated and untreated eyes could be established.

(*c*) Three rabbits were used, as in the previous experiment, but treatment applied 5 or 6 times a day for 3 days. Again no significant results were obtained.

A point of interest in these experiments is that some heavily infected eyes showed after some two months remarkably little scarring of the cornea. This applied to untreated eyes as well as to treated eyes.

2. *The effect of 30 per cent. sulphanilamide ointment.*—(*a*) Three rabbits' corneae were infected with B. pyocyaneus. Treatment was applied immediately after the inoculations and consisted of the instillation of 30 per cent. sulphanilamide ointment (oil in water emulsion base*) into the right eye and of the ointment base only in the left. Treatment was continued three times daily for a week. No tangible effect of the sulphanilamide ointment could be seen; in fact, the three left (control) eyes appeared to be rather less involved than the right eyes.

(*b*) In four more rabbits these experiments were repeated with this additional measure: a suture was passed through each of

* Composition:—Petroleum jelly 25 per cent., castor oil 25 per cent., lanette wax S.X. 5 per cent., water 45 per cent.

the four lids and the upper and lower suture on each side were tied in a bow after each application of ointment (or ointment base), so that the lids were closed during the course of the treatment, thus approximating the application of a bandage in the human patient. The results did not encourage further exploration of this procedure.

(*c*) In seven rabbits the infected right cornea was treated with 30 per cent. sulphanilamide ointment placed inside a contact lens fitting fairly accurately to the eye. The infected left eye had a contact lens with the ointment base only. The lenses were changed daily for 7 days. The picture in these cases was complicated by the fact that in rabbits whose cornea was not infected the wearing of a contact lens with sulphanilamide ointment or the base produced an irritative corneal lesion of the ground glass variety. No definite conclusions could be drawn, but it appeared that the (left) infected eyes treated with contact lens and ointment base showed more active lesions than the right eyes treated with contact lens and sulphanilamide ointment; in three rabbits the infective lesion in the right eye was definitely more under control than the left, and in two more, though the right eye showed less active infection than the left, there was a suggestion of a greater irritative reaction of the ground glass type (? due to poorer fit of lens, ? due to irritative action of the sulphanilamide ointment).

3. *The effect of sulphapyridine insufflation combined with 5 per cent. sulphanilamide ointment.*—In six rabbits the infected right eye was treated with immediate insufflation of sulphapyridine powder and the application of 5 per cent. sulphanilamide ointment applied under a lid suture as in 2 (*b*) three times daily for seven days. The infected left eye was untreated. In three rabbits there was no appreciable difference between the course of the infection in the right and left eyes. In the remaining three though severe corneal lesions were present; the treatment appeared to influence the course of the infection favourably.

4. *The effect of 30 per cent. sodium sulphacetamide administered intra-muscularly.*—In 14 rabbits the cornea of one eye was infected with B. pyocyaneus, the other eye having streptococci, pneumococci or staphylococci introduced into the anterior chamber. The animals, all weighing about 2 kilos, received no local treatment, but were given 5 c.c. of 30 per cent. solution of sodium sulphacetamide (1.5 grm.) intramuscularly immediately before infection and 2-3 c.c. on the three or four subsequent days. In no case (with one possible exception) was the B. pyocyaneus infection controlled to any extent, and this failure stood out strikingly against the generally favourable result on the fellow eyes infected with streptococci and pneumococci. These latter

results are discussed below. Here attention is drawn to the negative results of general treatment on B. pyocyaneus infection.*

B. INOCULATION OF STREPTOCOCCUS, PNEUMOCOCCUS AND STAPHYLOCOCCUS INTO THE ANTERIOR CHAMBER, COMBINED WITH INTRAMUSCULAR INJECTION OF SODIUM SULPHACETAMIDE. (Table II.)

The method of inoculation has already been described, and the administration of 30 per cent. of sodium sulphacetamide indicated (0.75 grm. per kilo before infection and 0.3—0.45 grm. per kilo daily for 3 or 4 days subsequently).

1. *Streptococcus haemolyticus in pure culture.*—Three rabbits thus infected in both eyes with 1/10 c.c. and treated with sulphacetamide showed severe iritis and hypopyon. In one eye of two of the infected rabbits the infective process was considerably less severe than in the remaining four eyes of these animals, and in a control rabbit which was infected but not treated. The subsequent experiments were carried out with diluted cultures.

2. *Streptococcus haemolyticus: broth culture diluted to* 1/10,000.—(*a*) Three rabbits thus infected in both eyes with 1/10 c.c. and treated with sulphacetamide showed definite iritis and flocculi of pus in the anterior chamber 24 hours after inoculation. With continued treatment the flocculi disappeared; the infection was clearly under control and spontaneous resolution of the remaining flocculi occurred after treatment was suspended on the fifth day. Remarkably little evidence of the iritis remained to be seen. In a control animal the infection ran a severe course.

(*b*) In three more rabbits the same procedure was followed, except that the left anterior chamber received 0.05 c.c. of the infecting material against 0.1 c.c. in the right. One of these animals died on the third day with both anterior chambers heavily infected. The two remaining rabbits reacted well to treatment, all the four eyes showed complete control of the infection after an initial iritis and pus formation.

3. *Streptococcus haemolyticus* 1/10,000 *in the anterior chamber of left eye and corneal infection with B. pyocyaneus of the right eye.*—Nine rabbits had the anterior chamber of one eye infected with 0.1 c.c. of the diluted broth culture and the cornea of the other eye infected with B. pyocyaneus. Intramuscular administration of sodium sulphacetamide for four days gave

* Two rabbits with pyocyaneus infection of one cornea and streptococcus inoculation in the anterior chamber of the fellow eye were demonstrated before the Ophthalmological Society in May, 1942. The animals had received sodium sulphacetamide intramuscularly; the streptococcal infection was controlled, the pyocyaneus infection completely uncontrolled.

TABLE I.—CHEMOTHERAPY IN B. PYOCYANEUS INFECTION OF THE CORNEA

	30% sodium sulphacetamide drops			*30% sulphanilamide ointment*			*Sulphapyridine powder and 5% sulphanilamide ointment*	*Sodium sulphacetamide intramuscularly*
	(a)	(b)	(c)	(a)	(b)	(c)		
Method of Application	Right eye treated 24 hours after inoculation three times daily for seven days. Left untreated	As in (a) but treatment commenced immediately after infection	As in (b) except that drops were applied 5 to 6 times daily for 3 days	Right eye treated with ointment immediately after inoculation three times daily for 7 days. Left eye treated with ointment base only	As in (a) but lid sutures also used	Right eye treated with ointment applied under a contact lens immediately after inoculation and changed daily for 7 days. Left eye treated with contact lens and ointment base only	Powder insufflated on to right cornea and ointment applied immediately after inoculation three times daily for 7 days. Lid suture. Left eye untreated	(The right cornea was infected with B. pyocyaneus. Other organisms were introduced into the left anterior chamber). No local treatment. General treatment for 3-4 days
Number of rabbits used	6	8	3	3	4	7	6	14
Results	Infection not controlled			Infection not controlled		In three rabbits the right (treated) eye probably favourably influenced	In three rabbits the infection was not controlled. In the three others? favourably influenced	B. pyocyaneus infection not controlled (? controlled in one case)

TABLE II.—CHEMOTHERAPY IN INFECTIONS OF THE ANTERIOR CHAMBER

Organism	Streptococcus haemolyticus both eyes		Streptococcus haemolyticus 1/10,000 dilution in left A. C.; B. pyocyaneus infection of right cornea	Pneumococcus 1/10,000 dilution left A. C. and B. pyocyaneus infection of right cornea	Staphylococcus aureus 1/10,000 dilution in left A. C. and B. pyocyaneus infection of right cornea	Streptococcus haemolyticus 1/10,000 dilution
	(a) Undiluted culture	(b) Culture diluted to 1/10,000				
Method of treatment	Sodium sulphacetamide (0·75 gm./kilo before infection and 0·3–0·4 gm./kilo daily for 3-4 days) intramuscularly					30% sulphanilamide ointment applied after inoculation and three times a day for 7 days. Lid sutures
Number of rabbits used	3	6	9	3	2	1
Results	In two out of 6 eyes infection partially controlled	One rabbit died on third day with heavy infection of both eyes. Infection well controlled in the others	Infection controlled in 7 out of 9 eyes infected with streptococcus. (B. pyocyaneus infection not controlled in 8 out of 9 eyes)	One pneumococcus eye uncontrolled; the two others partial control (B. pyocyaneus infections all uncontrolled)	Infection uncontrolled	Infection uncontrolled

uniformly poor results in eight of the nine eyes with pyocyaneus infection. In seven eyes the streptococcal infection was completely under control; in the remaining two, the eye was severely infected and became useless.

4. *Pneumococcus on broth culture diluted 1/10,000 into the anterior chamber of left eye and pyocyaneus infection of the cornea of the right eye.*—In three rabbits thus treated, the pyocyaneus infection was completely uncontrolled. The three eyes with pneumococcal infection did not give the same satisfying resolution as seen with streptococcal infection; one eye was completely lost from moderate panophthalmitis, and the two remaining eyes showed fairly severe iritis. A control animal showed a severe reaction in both eyes.

5. *Staphylococcus aureus (broth culture diluted 1/10,000) in the anterior chamber of left eye and B. pyocyaneus on the cornea of the right.*—Two rabbits thus infected and treated gave no response to either infection.

C. INOCULATION OF STREPTOCOCCI INTO THE ANTERIOR CHAMBER, COMBINED WITH 30 PER CENT. SULPHANILAMIDE OINTMENT IN THE CONJUNCTIVAL SAC AND LID SUTURE. (Table II.)

One rabbit thus infected in both eyes with 0.1 c.c. of 1/10,000 dilution of a broth culture of streptococcus haemolyticus and treated immediately for a week with 30 per cent. sulphanilamide ointment three times daily into the conjunctival sac, which was kept closed by lid sutures, showed extensive infection of both eyes.

4.—Discussion

The results recorded may briefly be summarised as showing that:—

(1) The general administration of sulphanilamide (in the form of sodium sulphacetamide) controls an intra-ocular inoculation of streptococcus haemolyticus, and possibly also of pneumococcus, but does not control corneal inoculation with B, pyocyaneus.

(2) The local application of sulphanilamide, sulphapyridine or sodium sulphacetamide appears to be largely ineffective against B. pyocyaneus infection of the cornea, and there is no reason for believing that it is effective against streptococci inoculated into the anterior chamber. There is some suggestion that sulphanilamide ointment applied under a contact lens might favourably influence the course of a B. pyocyaneus infection of the cornea, but all other methods of local application, including lid suture, which is an approach to the clinical procedure of bandaging the eye, appear ineffective.

These results confirm the findings of Rambo and Venco on the efficacy of the general administration of sulphanilamide on intraocular infection with streptococci, but they do not quite tally with the findings of Joy (1940 and 1942) and those of Robson and Scott (1942) for B. pyocyaneus of the cornea. The data recorded here are not strictly comparable with those of Joy, for this observer employed sulphapyridine. v. Sallmann, who administered sulphadiazine by mouth (18 hours after inoculation) could not control B. pyocyaneus infection of the cornea, and Joy's results remain as yet unconfirmed. It is, however, possible that the strain of B. pyocyaneus employed by Joy proved susceptible to the drug—and his *in vitro* experiments with different strains suggest this—whilst the strains employed by Sallmann were more resistant, and those used by ourselves were still more so. The same possibility arises in assessing the contrary results obtained by Robson and Scott and by ourselves in controlling B. pyocyaneus infection by local treatment. These conflicting results and uncertainty as to the capacity of some strains of B. pyocyaneus only emphasise that this organism—or rather group of organisms—pseudomonas—as they are now designated by bacteriologists—is not really a satisfactory agent for the study of the effect of chemotherapy in corneal lesions. In any case there is no full study available which compares the effects of general administration with local application. Granted the efficacy of the sulphonamides in B. pyocyaneus—or some strains of it—the question still remains whether local or general treatment is superior. On the experimental side this question is likely to remain until a suitable standard organism and a standard technique for corneal infection are available. The staphylococcus, which is known to be resistant to the sulphonamides and bizarre in its behaviour in the experimental animal, does not appear very promising.

In the meantime it is well to remember that clinical evidence in ophthalmology points to the vast superiority of general administration of the sulphonamides over the local application of these drugs. Easily the most striking results obtained with the sulphonamides in ophthalmology are those seen from the oral administration of sulphapyridine in ophthalmia neonatorum—a condition in which local therapy is useless, though the affection is essentially a superficial lesion and the local application of the sulphonamides should be ideally effective. Complex theoretical problems are involved here, and whilst it is gratifying that there is much intensive clinical exploration of the possibilities for the local use of the sulphonamides in ophthalmology it is well to remember that these clinical explorations are largely empirical and have not, as yet, firmly established experimental validity to support them.

Summary

1. The problems involved in the experimental study of ocular chemotherapy are indicated, stress being laid on the absence of a satisfactory technique for the organisms commonly met with in ocular infections and on the levels of concentration that different sulphonamides reach and maintain in ocular tissues by the general and local administration of these drugs.

2. A review of the literature on experimental chemotherapy by general and local administration of the sulphonamides is given.

3. Work is recorded which substantiates the claims for sulphanilamide in controlling experimental intra-ocular infection with streptococcus haemolyticus and possibly also pneumococcus (Table II). B. pyocyaneus infections of the cornea were not controlled either by the general administration of sodium sulphacetamide or by the use of this drug in a variety of ways as a local application (Table I).

4. In the absence of a more standard technique of inducing experimental infection of the cornea, the problem of the relative value of general and local use of the sulphonamides remains unsolved. The value of local therapy is still an open question.

Our thanks are due to Prof. J. H. Dible, in whose department at the British Postgraduate Medical School this work was carried out, for his kindly interest and helpful suggestions and for the facilities he placed at our disposal. We are indebted to the Royal Society for a grant to one of us to defray expenses. To Mr. F. W. Jelks and Mr. W. J. Goodwin we are obliged for their constant technical assistance, and to Messrs. Schering, Ltd., for liberal supplies of sodium sulphacetamide.

REFERENCES

BOYD (1942).—*Arch. of Ophthal.*, Vol. XXVIII, p. 205.

JOY (1940).—*Proc. Soc. Exper. Biol. and Med.*, Vol. XLV, p. 709.

——— (1942).—*Arch. of Ophthal.*, Vol. XXVII, p. 1135.

RAMBO (1938).—*Amer. Jl. Ophthal.*, Vol. XXI, p. 739.

ROBSON AND SCOTT—(1942).—*Brit. Med. Jl.*, Vol. I, p. 5.

——— (1943).—*Lancet*, Vol. I, p. 100.

V. SALLMANN (1942).—*Amer. Jl. Ophthal.*, Vol. XXV, p. 1292.

SORSBY (1942).—*Trans. Ophthal. Soc. U.K.*, p. 62.

VENCO (1939).—*Ann. Ottal. e Clin. Ocul.*, Vol. LXVII, p. 179.

A STANDARDIZED COLOUR-VISION TESTING LANTERN (II) TRANSPORT TYPE

BY

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THE purpose of this note is to describe a modification of the standardized colour vision testing lantern designed by the present writer (Martin, 1939), which should render it specially suitable for use by transport undertakings.

Experience has shown, however, that the mariner's test was a very satisfactory one in itself. Therefore the modifications are supplementary, and the marine form of the test can be carried out with the new form of the lantern if desired, as well as the "transport" tests.

The additions consist of an orange-yellow filter in addition to the original red, green, and white of the first form; so that pairs of "red with orange" and "orange with green" can be shown. Rail and road signals now employ orange signal lights extensively, and on many grounds familiar to those dealing with the personnel to be tested it is desirable to make the test simulate practical conditions.

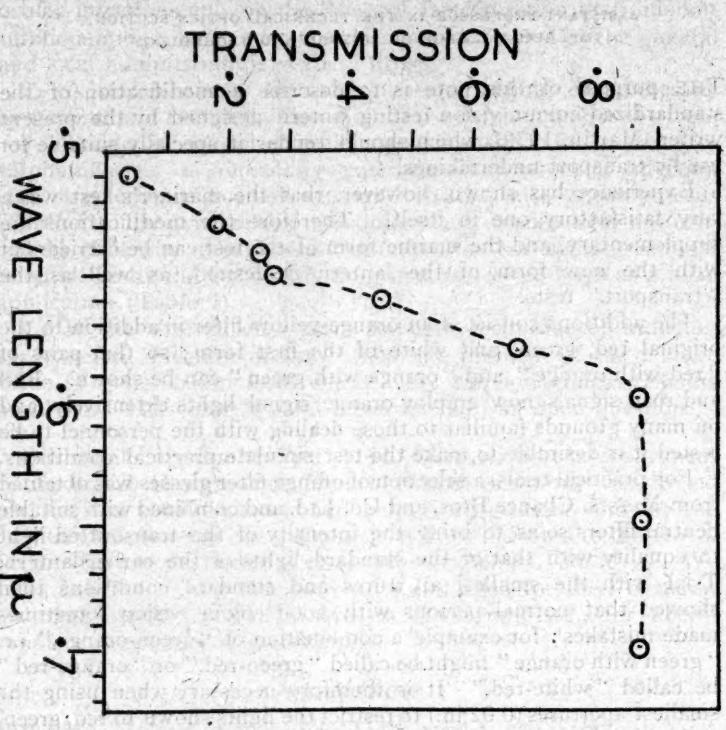
For practical trials, a selection of orange filter glasses was obtained from Messrs. Chance Bros. and Co. Ltd. and combined with suitable neutral filters so as to bring the intensity of the transmitted light to equality with that of the standard lights of the earlier lantern. Trial with the smallest apertures and standard conditions then showed that normal persons with good colour vision sometimes made mistakes; for example a combination of "green-orange," *i.e.* "green with orange" might be called "green-red," or "orange-red" be called "white-red." It is therefore necessary when using the smallest apertures (0·02 in.) to restrict the lights shown to red, green, and white as in the well-established mariners' test; and this is even more important when the modifying glasses are used with the small apertures.

Trial showed, however, that when the apertures were enlarged to 0·05 ins., the distinctions were very easy to normal vision, and this suggested the use of 0.04 in. as a standard size for the pairs of apertures with which the supplementary part of the test can be conducted.

Experiments were made with a number of orange glasses and it appeared that, out of those available, a filter stated to have a hue wave-length of 5970A * was the most readily distinguished from

* With regard to a source at 2360 K. The true wave-length with regard to the lantern illuminant will be a little smaller.

the "white" on the one hand and red on the other. A transmission curve for this glass is appended. Reference to recent results on colour discrimination (for example Wright, 1941) shows this choice to be generally suitable. As regards filters used in practical signalling, British standard specification BSS 623 gave limits of



5970A to 5930A for yellow glasses to be used with a lamp working at 2360°K.

As regards angular subtense, the 0·04 ins. aperture seen at 20 ft. corresponds to a 4 in. railway lens seen at 667 yards, but the comparison is not particularly useful, owing to the relatively low brightness of the lantern, which gives the effect of a signal at a much greater distance. The 0·02 aperture naturally gives the effect of a doubled distance. In both cases the aperture is below the resolving limit of the eye (as seen from the standard distance of 20 ft.) so that the area effect is simply integrative.

As mentioned above, full trials have shown that no mistakes at all are expected from normal-sighted persons with the large aperture

(0·04 in.) even when "orange against green" has to be distinguished from "red against green." Fortuitous mistakes sometimes occur due to nervousness or poor vision apart from colour defectiveness, but when confidence has been established the mistakes will not persist as in the case of genuine disturbance of colour vision. By the kindness of Dr. Graves Pierce of the L.M.S. Railway Medical Dept., the lantern was used by him in testing several persons who had already been tested by another lantern. All these appeared to be dichromats with severe colour defects, and the indications of the standard lantern were found to confirm this. Unfortunately owing to war conditions, detailed results are not available. Dr. Pierce found the test more "drastic" than the one usually applied, owing to the relative smallness of the apertures.

Owing to the present difficulties it has only been possible to obtain systematic results from three anomalous trichromats with a lantern which had been modified by substituting an orange filter for a red. It was then situated between another red and a green—so that red-orange and orange-green contrasts could be included in the series. The results shown in the table do not include those also taken with the dimming glasses in use, as these only confirmed the results which can be obtained with the full brightness.

Colours shown	Mr. S.		Mr. C.		Mr. W.	
	Aperture 0·04 in.	0·02 in.	Aperture 0·04 in.	0·02 in.	Aperture 0·04 in.	0·02 in.
W G	*R* G	*G* G	W *W*	*G* G	W *W*	*R* G
G G	G G	G G	G G	G G	*W W*	G G
G R	G R	G R	G R	G R	*W* R	G R
R W	R *G*	R *G*	R *G*	R *G*	R W	R *R*
W W	*G G*	*G G*	*G G*	*G G*	*R R*	*G G*
W R	*G* R	*G* R	*G* R	*G O*	W R	*G* R
R O	R *G*	R *G*	R *G*	R *W*	*W W*	R *R*
O G	*R* G	*G G*	*G G*	*W* G	*W* G	*R* G
G W	G *G*	G *G*	G W	G W	*W* W	G *R*
Mistakes	8	8	7	8	10	8

The results show that the addition of the orange glass definitely increases the range of the test, as should be the case for candidates who ought to be able to distinguish orange in addition to red, green,

and white. Needless to say, all the above candidates would fail to "pass"; the first two confuse "red-orange" with "red-green." Mr. C. is under difficulties even when allowed to approach the lantern as closely as possible; he named "orange-white" as "orange-green" and "red-orange" as "two reds." However, in this he is unlike some candidates, who find their difficulties increase very greatly with diminished apparent area and brightness of the colours.

It may be suggested that no candidate is suitable for duties as a railway driver who fails repeatedly to pass the test with larger apertures without a mistake.

The colour filters of the modified Lantern as well as the old form, are all standardized and approved by the National Physical Laboratory according to specifications being deposited with the Medical Research Council.

In order to give a closer impression of railway signals, the Marine form of the Lantern is still used, but arranged with its general axis of symmetry horizontal, and the lights are seen vertically disposed instead of horizontally. The handle of the lantern acts as a foot in this arrangement.

Other changes in the new pattern of the Lantern have been introduced by the capable makers, Messrs. Kelvin, Bottomley and Baird, Ltd.

(*a*) The examiner's illuminating lamp has been removed from the interior of the lantern; light from the volt-meter unit illuminates the examiner's writing pad.

(*b*) The base of the lantern has been perforated so that manipulation of the hand "capstan" wheel for changing the glasses is easy when the lantern is used on its side.

(*c*) A guard has been fitted over the opening so that the candidate cannot see the combination key-letters direct.

The tests suggested for transport undertakings are as follows:—

(1) A test with the eleven combinations including the orange using the larger apertures (0·04 in.).

(2) A test with the nine combinations excluding the orange using the smaller apertures.

For candidates making mistakes in the above, and requiring further tests:—repeat (1) and (2) using the modifying glasses.

It is expected that in practice, medical officers will find that part (1) above is sufficient, but it is not claimed at present that this test is established as satisfactory in the same sense as Part 2 with its years of proven utility. It is probably advisable that both parts should be used until full confidence in the adequacy of Part 1 is obtained. War conditions have prevented the full testing of Part (1) in the writer's laboratory, as the necessary border-line subjects are not easy to find; especially those with time to spare for tests.

There is every reason to adopt a severe test for *entry* to any

service of a permanent character, since a matter of such importance is to be decided. There would seem to be every reason for an agreement on some standardized test which would prevent any candidate from passing in one form of test, spending years, perhaps, in training and then failing to pass a more drastic test in the end.

The assumption of responsibilites which a person is unfitted to bear is a grave mistake both on the part of the person himself, and those who allow him to do so. But if a test is strict it must be also just; the real disadvantage of cheap and untried tests is their variability. It is here that the chief possibility of injustice in colour vision testing is to be found. It looks as if it should be easy to obtain a durable and consistent test; actually it takes a very great deal of care to make one. The present Lantern is an effort in that direction.

I am indebted, as before, to those whose help was acknowledged in the previous paper, and in addition to Mr. H. V. Walters for measuring the transmission of some of the filters; also to Dr. Graves Pierce for the help mentioned above.

REFERENCES

MARTIN, *Brit. Jl. Ophthal.*, Jan. 1939.
WRIGHT (1941).—*Proc. Phys. Soc.*, Vol. LV, p. 93.

GLIOMA OF THE RETINA. A REVIEW OF TWELVE CASES*

BY

W. B. E. McCREA

DUBLIN

THIS communication is a clinico-pathological study, based on the twelve patients suffering from the so called glioma of the retina, treated in the Royal Victoria Eye and Ear Hospital, during the years 1938-42 inclusive. To clarify our ideas at the outset, it seems worth while to have some form of classification. I have followed that suggested by Sir Stewart Duke-Elder in his text-book. As he points out, in the present state of our knowledge, any classification can only be of a provisional nature. The divisions of the group are as follows:—

(*a*) Retinoblastoma—corresponding to the medulloblastoma of the brain. These comprise the great majority of "gliomata."

* Received March 13, 1943. Read at Dublin Ophthalmological Society, February 24, 1943.

Owing to the embryonic nature of the cells malignancy is high. They most often arise from the inner nuclear layer and next most often from the ganglion cell and nerve fibre layers.

(*b*) Neuro-epithelioma—they are composed of primitive spongioblasts. The external nuclear layer is the usual point of origin. In the pure form they may arise from the ciliary processes. These growths show rosette formation, the presence of which is evidence of partial differentiation into rods and cones. In consequence a somewhat lower malignancy is found.

(*c*) Medullo-epithelioma—are very rare. They arise from the ciliary epithelium—the place where the medullary epithelium of the primitive neural tube persists in almost undifferentiated form.

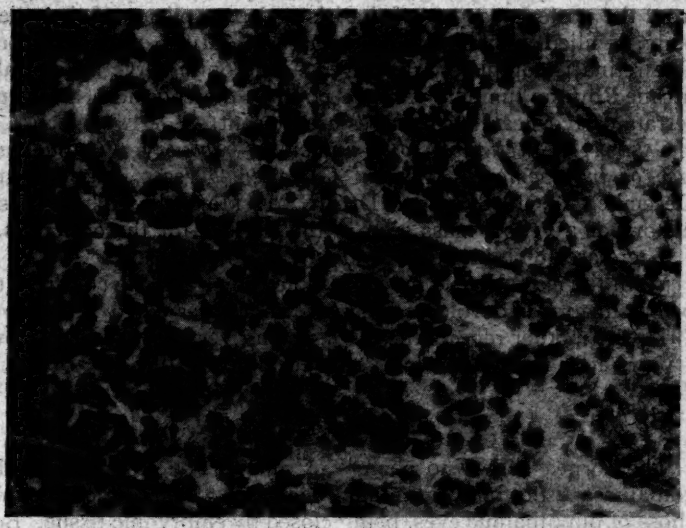
(*d*) Neurocytoma—a few tumours have been described with their cells differentiated as neuroblasts or neurocytes.

(*e*) Astrocytoma—arises from true glial tissue, and for it the term glioma ought properly to be reserved. It is common in the brain, but surprisingly rare in the eye, since astrocytes are plentiful in the retina. The tumour appears in the second or third decades of life. The first two groups are, of course, relatively common, the last three exceedingly rare.

CASE I. *Bilateral retinoblastoma—orbital extension—death.*—Edward P., was admitted in August 1937 when aged 1 year, under the care of Mr. L. E. Werner. A " glioma " of the right eye was present and the eye was removed on August 26. There was a suspicious looking mass in the left fundus and in consequence it was decided to implant two radon seeds on the sclera.

These were left in position for 8 days. The patient was discharged on November 8. On December 15 the child was readmitted with a fungating mass protruding from the left socket. The left globe was removed and the orbit exenterated. He received radium treatment. He died in March 1938.

The pathological exhibit in this case is a section of a piece of tissue taken from the left orbit, the globe unfortunately not being available for study. The section shows a very vascular piece of tissue, covered by epithelium, under which there is tumour cell infiltration in places. Then comes an area of elastic and hyaline tissue containing in its deeper layers some retinoblastoma cells. Deep to this is an area of tumour cells, arranged in masses and columns in an irregular fashion, supported by a rather delicate elastic and hyaline tissue matrix. There is a plentiful supply of blood vessels. The cells on the whole are rather larger than those usually found within the globe in tumours of this kind. They have a large circular nucleus staining well, and a very small cell body, polygonal or circular in shape. Necrotic areas so characteristic of retinoblastomata within the globe, are absent.



CASE I.

Section through piece of orbital tissue showing retinoblastoma cells.

CASE II. *Unilateral retinoblastoma with invasion of nerve head, orbital extension—death.*—Mary D., was admitted on July 7, 1938, to hospital under the care of Dr. E. M. Maxwell. She was then aged 2 years and 9 months. About 7 months previously the mother noticed a " golden speck " in the left eye. There were seven children in the family, all of whom were healthy.

A " glioma retinae " was diagnosed and the left eye excised on July 15. The socket was treated by Dr. Stumpf at Baggot Street Hospital. On July 28 she was discharged with instructions to return in 3 months. She was lost sight sight of until March 14, 1939. There was then present a hard mass in the orbit; biopsy showing " glioma " cells to be present. She was seen by Dr. R. H. Micks, on April 4, when she had a pulse of 60 and neck rigidity. A consultation with Mr. A. A. McConnell was advised, but the mother refused to consider any further operative treatment. On April 10 she was discharged. She died six weeks later.

Microscopic

Except for some blood vessels lying under the epithelium the cornea is normal. The anterior chamber is also unchanged. The

iris and ciliary body are markedly atrophied. The entire globe from the posterior aspect of the iris and pars plicata of the ciliary body, is filled with retino-blastoma cells. Much of it is necrotic. The retina is completely destroyed. The optic nerve head is also invaded by the tumour. At one point in the choroid near the ora serrata early calcareous changes are present.

Case III. *Retinoblastoma-uniocular—recovery. Optic nerve free of involvement.*—Clement G., aged 2 years, was admitted December 13, 1938, under Dr. E. M. Maxwell. There was a history of a yellow mass seen in the left eye for three months.

There are 13 children in the family; all normal.

With the exception of myopia in the father and the children, the ocular history is devoid of interest. In a letter dated February 1, 1943, the mother reports the boy as being very well, *i.e.*, just over 4 years after removal of the eye—December 16, 1938.

Microscopic

The cornea shows no change of note. The anterior chamber contains a little finely granular coagulum. The angles resemble those of buphthalmic eyes, being closed by embryonic tissue. Both iris and ciliary body are atrophied. The vitreous chamber is filled almost entirely with tumour, small groups of cells extending up to the back of the lens. Small portions only of the retina remain undestroyed, but here and there the origin from both inner and outer nuclear layers can be made out. The characteristic arrangement of a retino-blastoma is present, active, deeply staining cells, arranged about a central blood vessel, are to be seen, intermingled with poorly staining, necrotic cells. A few small haemorrhages are present. Some islets of commencing calcareous change are present, but are few and inconspicuous.

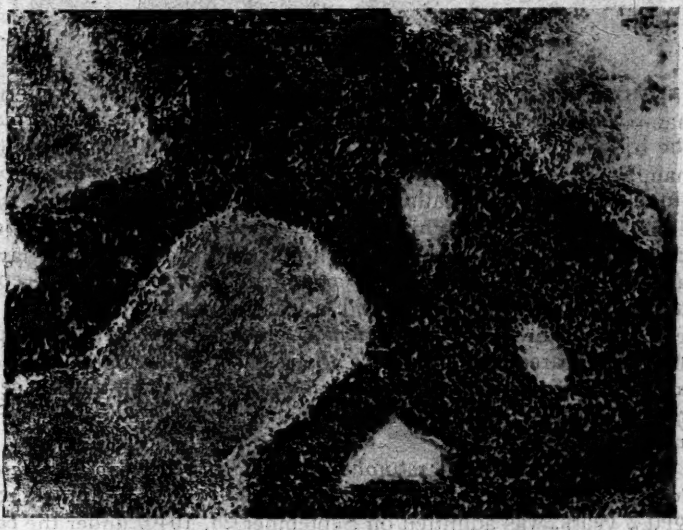
Sections through the cut end of the optic nerve show it to be free of involvement.

Case IV. *Uniocular retinoblastoma, invasion of optic N.—outcome untraced—presumed dead.*—Gabriel H., aged 2½ years, was admitted September 22, 1939, under the care of Mr. A. J. Mooney, who diagnosed a glioma retinae in the left eye. The globe was removed September 23. Healing was uneventful and he was discharged September 29. Unfortunately the family have changed their home and it has been impossible to trace the patient.

Microscopic Examination

The cornea is normal. The iris is atrophic and there is ectropion uveae. The ciliary body is also atrophied. Except for some

granular coagulum, the anterior chamber is empty. The vitreous chamber is filled with tumour cells extending right up to the back of the lens and the suspensory ligament. It is a very active looking retino-blastoma, the cells being grouped about a central vessel in the usual manner. Among these are necrotic areas and small haemorrhages. There are a few calcareous nodules. The growth is of the endophytum type. It appears to arise chiefly from the inner nuclear layer of the retina, but in places it can



CASE IV.

Showing retinoblastoma cells surrounding a central blood vessel. A large necrotic area also appears in the section.

be seen to arise from the outer layer also. The choroid is extensively invaded on one side in the neighbourhood of the ora serrata. A blood vessel traversing the sclera in the equatorial region contains tumour cells. The optic nerve is extensively invaded right up to the cut end.

In the light of the microscopic findings this case could probably be included among the fatal ones.

CASE V. *Uniocular retinoblastoma—well, 3½ years later. Invasion of optic nerve as far as lamina cribrosa.*—John F., aged 4½ years, was admitted under the care of Mr. F. Lavery on September 28, 1939. He is an illegitimate child, so that family and personal

history are necessarily curtailed. He has been with a foster mother since he was 11 months old. The latter did not notice anything wrong until the child was just 4½ years old, when the left eye was seen to squint and a white gleam was noticed in the pupil. There was a history of a fall 4 months previously. On examination a white mass with blood vessels on the surface, involving most of the retina, was seen.

On October 5, the left eye was excised and a glass ball implanted. He was seen in February 1941, March 1942 and February 1943, the findings on each occasion being normal.

Microscopic Examination

Apart from a little finely granular coagulum in the anterior chamber the appearances of the cornea and chamber are normal. The iris and ciliary body show little or no atrophy. The vitreous chamber is filled in its posterior ¾ with tumour cells and albuminous coagulum beneath a completely detached retina. It is a retino-blastoma arising chiefly from the inner nuclear and ganglion cell layer, but here and there an origin from the outer nuclear layer can be made out. The typical arrangement of masses of deeply staining cells arranged around a central vessel, and areas of necrotic cells are present. Haemorrhages are absent. A couple only of calcareous nodules are to be seen. The optic nerve is extensively involved up to the lamina cribrosa. The tumour cells are just starting to break through, but have not reached the nerve outside it.

CASE VI. *Bilateral retinoblastoma—death 10 months later. Both optic nerves involved outside lamina cribrosa.*—Mary A. S., aged 2 years, was admitted on September 25, 1940, under the care of Mr. A. J. Mooney. The history given was that the right eye was noticed to be abnormal at 1 year and 7 months old. There are three other children in the family, all healthy and with good sight. The parental history, on both sides, is negative. On account of the staphylomatous, painful condition of the eye it was removed, the patient being discharged after an uneventful convalescence on October 11. Re-admission took place on April 19, 1941, when a retinal tumour was found to be present in the left eye. This globe was excised and deep X-ray treatment given at St. Anne's Hospital. Death took place on July 22, 1941.

Microscopic Examination

Right Eye.—This globe is staphylomatous, measuring antero-posteriorly 28 mm. and in the equatorial region 21 mm. The

CASE VI. RIGHT EYE

Showing staphylomatous globe and anterior chamber full of growth.

CASE VI. LEFT EYE

Shows invasion of deeper corneal layers by tumour cells.

cornea is not invaded by tumour. The anterior chamber is filled with retinoblastoma cells which have destroyed the iris and ciliary body. The lens, showing some cataractous changes, is *in situ*. The central third of the vitreous chamber is occupied by the main mass of the growth which appears to be arising from the neighbourhood of the optic disc and extends forwards towards the back of the lens. The retina is wholly destroyed. The optic nerve is involved outside the lamina cribrosa, though not grossly so.

Left Eye.—The cornea is very oedematous. There is some invasion of the deeper corneal layers by tumour cells. The anterior chamber contains a large amount of cell growth. The iris is represented only by a narrow strip of fibrous tissue. The ciliary body has been completely infiltrated by growth. Three-fifths of the vitreous chamber is occupied by the main mass of the retinoblastoma and the remainder is filled by an albuminous coagulum containing numerous " satellites." Necrotic areas just behind the lens are undergoing commencing calcareous degeneration. The retina, except for a small area close to the ora serrata on one side, has been totally destroyed. There is invasion of the optic nerve outside the lamina cribrosa.

Case VII. *Retinoblastoma-bilateral—death 9 years after first eye involvement, Second eye (i.e., R.E.) optic nerve involved up to cut end*.—Maureen O'C., aged 8 years, was admitted April 23, 1941, under the care of Dr. A. J. Mooney. She had been admitted before when aged 1 year 10 months—December 20, 1934—to this hospital. Her history then was of a fall out of a pram 4 months previously, when she struck her left eye against the kerb. Seven weeks later the parents noticed a " grey spot covered with red veins." She had always been a healthy child. There are 6 other children, all with good sight : parental history also negative. On her first admission a greyish mass was noted in the left fundus and a diagnosis of " glioma " retinae made. The globe was excised January 5, 1934, healing being uneventful. In October, 1939, Dr. Mooney noted a large yellow mass in the retina below, the vitreous being full of cells. A diagnosis of glioma or tubercle was made. She was given radium for six weeks and in February of the following year she was noted as being improved. Unfortunately however the regression was of a temporary nature only, for in April, 1941, she was admitted again with a blind and painful right eye. This was enucleated and she was referred to St. Anne's for therapy. Death took place at the end of January, 1943. Her father wrote in December, 1942, that the left socket, *i.e.*, the first globe removed, had remained free of trouble. The right, however, he said was causing the trouble.

Microscopic Examination

Right Eye.—The cornea is oedematous, both angles are closed by peripheral anterior synechiae. The iris and ciliary body are atrophied. There are numerous scattered tumour cells close to the posterior lens capsule. The retina is almost completely destroyed and the sub-retinal space contains much retinoblastoma tissue,

CASE VII.

Shows extreme degree of infiltration of optic nerve outside lamina cribrosa.

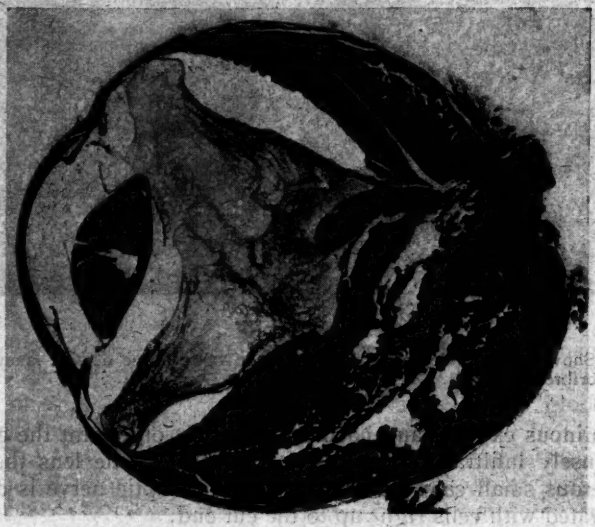
albuminous exudate and haemorrhage. At one point the choroid is densely infiltrated with cells. Just behind the lens there are numerous small calcareous particles. The optic nerve is densely infiltrated with cells right up to the cut end.

CASE VIII. *Retinoblastoma—unilateral-extra-ocular extension, slight involvement of optic nerve, outside lamina cribrosa—death.* —Thomas D., aged 3 years, was admitted under the care of Mr. McArevey, December 11, 1941. The history was that the mother noticed a " turn " or " cast " in the right eye at 12 months which grew more pronounced. There are five other children in the family, who are said to have sound eyes. No history of any ocular disease, on either side in the parents, was elicited.

On ophthalmoscopic examination of the right eye, a large woolley white area extending to the temporal side of the disc with haemorrhage and a retinal detachment below, were seen to be present. On December 18, the R.E. was excised. On January 2, 1942, the child was sent for deep X-ray to St. Anne's Hospital. The treatment was interrupted by an attack of measles for which he was treated at Cork Street Hospital. On March 27, he was retransferred to St. Anne's. He was sent home towards the end of April and died May 9, 1942. The other eye was said to have been involved.

Microscopic Examination

Right Eye.—The cornea is normal. The anterior chamber contains some albuminous coagulum. Both angles are closed by peripheral anterior synechiae. Iris and ciliary body are atrophic.



CASE VIII.

Showing extra-ocular extension at the posterior pole.

Arising from the retina in the neighbourhood of the optic disc there is a retinoblastoma-exophytum—which with a considerable amount of albuminous exudate completely detaches the retina. This growth extends to the disc and invades the nerve outside the lamina cribrosa. On one side of the disc between the atrophied

choroid and the sclera there is a solid mass of tumour which at the edge of the disc infiltrates through the sclera. Outside the globe in relation to this mass of growth, there is an extra-ocular extension. On the other side of the disc there is a similar cell mass lying between sclera and choroid.

CASE IX. *Retinoblastoma—uniocular—no involvement of optic nerve—free of recurrence after 8 months.*—Owen K., patient of Dr. McArevey, aged 3 years, was admitted on May 1, 1942. His parents gave a history of his not seeing objects well with the left eye and of having had a " stare " in it from birth. The family history was negative—there are two other children alive and with normal eyes; parents and their relatives are all alive and normal. On examination he was found to have a whitish mass in the left fundus which was diagnosed as a glioma retinae and excision advised. The right eye has a zonular cataract which makes it difficult to state categorically that it is normal. The fundus has been examined repeatedly and seems to be healthy. The child was last seen in January, 1943, and nothing abnormal was noted either in the right eye or in the socket.

Microscopic Examination

The cornea and anterior chamber do not show any changes of note. The iris and ciliary body are little atrophied. The retina is almost completely detached by an albuminous coagulum in which some isolated retinoblastoma cells are present. The tumour takes origin from both outer and inner nuclear layers of the retina. It falls into the category of " glioma " endophytum—occupying about one third of the vitreous chamber. One small calcareous nodule only was found. The optic nerve is free of tumour.

CASE X. *Neuro-epithelioma in the left eye, in male aged 67 years. Right eye degenerate—no neoplasm. In good health 8 months after excision.*—Robert R., aged 67 years, was admitted for the first time in February, 1937, under the care of Dr. J. B. McArevey. He was then aged 62. Investigation of personal and family history revealed nothing of note. A posterior cortical cataract was present in R.E. projection was fair, vitreous fluid with gross floaters, no detachment of the retina to be seen. The condition of the left eye at this time was: V=6/60 c-2·50 D.sph.=6/24, incipient cataract, fine vitreous floaters. On March 1, 1937, an intracapsular extraction, with a complete iridectomy, was performed on right eye, going off uneventfully. On March 12, he was noted as having gross vitreous floaters and a retinal detachment. Further treatment was not advised and he was sent out March 17, 1937. He was re-admitted February 26, 1942, when

the left lens was found to be cataractous—projection inaccurate. Tension (Schiötz) 23 mm. On March 5, 1942, an intracapsular extraction with a complete iridectomy was done. A membrane was seen at this time in the vitreous. The eye remained red and painful, in spite of treatment by N.A.B., sodium salicylate and other procedures.

On April 29, a large hyphaema was present. As the pain persisted and in view of the inaccurate projection it was considered better to excise the globe. This was done on June 10, 1942. In view of the pathological findings in the left eye it was thought wiser to remove the right, which was done September 30, 1942. In February, 1943, the patient reported himself as being in good health.

Microscopic Examination

Left Eye.—Cornea shows no change of note. The anterior chamber contains a large hyphaema. Both iris and ciliary body are much atrophied. Behind the iris there is an ellipse of compressed, amorphous material, resembling lens material, and surrounding this some loosely arranged vitreous, containing blood. Posterior to this is a completely detached and folded up retina. Behind the

CASE X.

Showing rosette formations.

retina and in relation to the choroid, there is a good deal of albuminous exudate containing tumour cells. At one point the origin of the growth from the external nuclear layer can be made out.

The choroid is invaded by cells at one place near the ora serrata. The central part of the vitreous chamber (about 2/3 of the whole) is occupied by growth. It is a neuro-epithelioma containing many rosette formations. Much of the tumour is necrotic but a large part stains well. The optic nerve is intact behind the lamina cribrosa, but in front of this there is invasion by neuro-epithelioma cells.

Right Eye.—Sections show this to be a very degenerated eye with much congestion in the ciliary body and choroid. There is a considerable amount of calcareous degeneration posteriorly in the choroid, and a few small (early) areas in the ciliary body. The retina is completely detached and folded up. There is no sign of any neoplasm.

CASE XI. *Retinoblastoma-uniocular—optic nerve not involved. In good health 8 months after removal.*—John M., aged 2 years. Patient of Dr. A. J. Mooney, was admitted on August 5, last. A diagnosis of glioma in the left eye was made and the eye removed.

Microscopic Examination

The cornea is normal. The anterior chamber contains some albuminous coagulum. There is a peripheral anterior synechia on one side. Both iris and ciliary body are much atrophied. An albuminous coagulum is present in the meshes of the suspensory ligament. Behind the lens there is compressed vitreous. Posterior to this are masses of retinoblastoma cells—endophytum, arising from the outer nuclear layer of the retina.

The anterior part of the growth shows a good deal of calcareous degeneration. In a general way the tumour forms a peripheral circle remaining in relation to the retina—glioma planum—while the centre of the vitreous chamber is occupied for the most part by an albuminous coagulum. There are some haemorrhages present. The retina is detached (not deeply) by an albuminous coagulum containing a few tumour cells. The choroid is atrophied. The optic nerve is not involved.

CASE XII. *Retinoblastoma-uniocular — optic nerve — commencing invasion—in good health 4 months later.*—Philomena D., patient of Dr. A. J. Mooney, aged 3½ years, was admitted on October 19, 1942. A glioma retinae of the right eye was diagnosed and the eye was removed on October 22.

The socket and left eye were again examined in November and December and found healthy.

Microscopic Examination

Right Eye.—The cornea shows no change of note. The anterior chamber contains an albuminous coagulum. The iris is very atrophied, numerous thin walled vessels being present. The ciliary body also shows a high degree of atrophic change. The vitreous is coagulated behind the lens. The retina is completely detached. The vitreous chamber is filled with retinoblastoma cells—exophytum. There are a few badly staining satellites in contact with the choroid in the sub-retinal space. The main mass of growth shows many active cells grouped in a circular manner about a central blood vessel. Amidst these are palely staining necrotic areas. Calcareous changes are absent. Here and there in the growth fairly copious haemorrhages are to be seen. The optic nerve shows just commencing invasion by tumour cells, but the lamina cribrosa is not reached. The cut end of the nerve is free of cells.

Comment

The incidence in this series of 12 patients is 1 in 6,126, *i.e.*, 0·0017 per cent. This is a rather less frequent incidence than has usually been reported in the literature—0·04 per cent. to 0·01 per cent. (0·009 per cent. in 40 years at Innsbruck-Badtke).

Age.—Two-thirds of the patients were 3 years old, or under, when they came under observation, the ages of the remainder being 8 (seen originally at 1 year 10 months), 3½, 4½ and 67 years respectively. The last case appears to constitute a record—48 years (Verhoeff), 66 and 35 years (Gerard & Morel) being the oldest reported.

Sex.—8 males, 4 females. The figures in the literature give about equal numbers affected.

Heredity.—In none of these cases was it possible to trace any hereditary factor.

Eyes Involved.—Bilateral 3 cases, unilateral 9.

Trauma.—There was a history of trauma in two cases.

Mortality and Recovery.—Of the twelve cases, 5 are known to be dead, one untraced, presumed dead, and 6 are alive and well for periods varying from 4 years to 4 months since the excision of the eye. Of the fatal cases, the period elapsing between the diagnosis and removal of the eye, and the fatal end, was in Case I seven months, Case II nine months, Case VI ten months, Case VII nine years, Case VIII five months.

Condition of optic nerve and extra ocular extension.—Only one globe, Case VIII, had a demonstrated extra-ocular extension. Cases I and II had microscopically proved invasion of the orbital tissues.

Case V is of particular interest in that there was invasion of the optic nerve, as far as the lamina cribrosa, with recovery, the patient being in good health 3½ years later (3 years being generally regarded as the length of time necessary before a cure can be regarded as having taken place).

All the cases with optic nerve involvement outside the lamina cribrosa died.

Tumour Type.—There were 11 cases of retinoblastoma of which 5 have died and one of neuro-epithelioma (alive 8 months after operation). Parkell and Benedict in a review of 16 traced cases of retinoblastoma, found only 12·5 per cent. had a good result, while 62·5 per cent. of neuro-epitheliomas in a series of 16 traced cases, had a good result. Badtke in a review of the glioma cases at Innsbruck from 1900-1939 (14 cases) considered the chance of cure from 50 per cent. to 60 per cent. He put the recovery figure in the bilateral cases at 33 per cent. All the bilateral cases in the Royal Victoria Eye and Ear Hospital series were fatal.

In conclusion I would like to tender my sincere thanks to my colleagues on the staff, for their generous co-operation in the matter of pathological material from and clinical information on, these cases.

I would also like to express my appreciation of the help given by Miss Connor, our Almoner, in "follow ups" and by Miss McQuaid in the collection of statistical data.

ANNOTATION

Blind Painful Eyes

We believe it to be a sound rule of practice that blind painful eyes should be enucleated. Especially should this be so if one does not know and cannot see what is the matter inside the eye. A highly congested eye with turbidity of the media may show a dull yellow reflection in the depths of the vitreous. It may be an inflammatory condition and if one is led away by this hypothesis into eviscerating the eye rather than removing it *in toto*, one must not be surprised if one later finds that there is a new growth steadily increasing in the socket. Such a case would hardly be one of every day occurrence, but perhaps once or twice in a lifetime of practice it might occur. We have always held the opinion that one learns more from failures, our own as well as those of others, than from

successes. Intra-ocular growths may be exceedingly difficult cases or extremely easy. We call to mind a case in a middle-aged woman who came to Moorfields in our early student days. On her first visit she had been seen by the chief clinical assistant; the pupil had been dilated, the refraction estimated and glasses ordered. A few weeks later she returned and said the glasses had not relieved her symptoms. Her statement was:—"I still see a cloud at the side of what I look at." On taking the field a large peripheral defect was evident and on examining the fundus it was obvious that she had a choroidal sarcoma. It always pays to listen to the patient's history even if it may be very diffuse, and to note the salient points in the history. Years later a case was admitted to hospital. Here one eye was blind and painful with a yellowish reflex from behind the lens; the fellow eye showed extensive retinal haemorrhages and sclerosis of the vessels. It was decided to eviscerate the blind eye, leaving a cuff of sclera round the optic nerve. A few weeks later the patient came with a tense bulging tumour in her socket.

THE COUNCIL OF BRITISH OPHTHALMOLOGISTS

Annual Report—1943

No report has been issued by the Council since that for 1938-39; this report therefore covers the period 1939-1943. No Meetings of the Council were held between July, 1939, and August, 1942, and no Meetings of the Executive Committee between April, 1940, and July, 1942, owing to war conditions.

At its Meeting on August 20, 1942, the Council elected the following officers:—President: Sir John Parsons; Vice-Presidents: Mr. R. A. Greeves and Mr. W. H. McMullen; Hon. Treasurer: Mr. Humphrey Neame; Hon. Secretary: Mr. Frank W. Law.

The following were appointed to serve on the Executive Committee:—The President, the Hon. Treasurer, the Hon. Secretary (*ex-officiis*), Mr. Cardell, Mr. Doyne, Mr. Greeves, Mr. MacCallan, and Mr. McMullen.

As the result of a request from the three Royal Colleges, a Committee was appointed to represent Ophthalmic Consultants to collaborate with the Royal Colleges. The Committee was as follows: Sir John Parsons, Mr. Greeves, Mr. McMullen, Mr. Alabaster, Mr. Rugg-Gunn, Mr. Harman, Miss Mann, Mr. Cardell, Mr. Duthie, Mr. Savin, Mr. Law. This Committee has not so far been called upon.

The Council records with regret the deaths of the following

permanent members: Sir George Berry, Dr. C. H. Usher, Mr. Percival Hay, and Mr. Malcolm Hepburn, who was Honorary Secretary till the time of his death.

Mr. Cardell and Mr. Doyne were re-elected observers on the Ophthalmic Group Committee of the British Medical Association.

In response to a request from the Secretary of the Inter-Departmental Committee on Medical Schools a Sub-Committee was set up with the object of drafting a memorandum on the terms of reference of the Committee, in so far as they related to Ophthalmology, with the following constitution: Sir John Parsons and Mr. F. W. Law (*ex-officiis*), Mr. McMullen (Chairman); Mr. Affleck Greeves (Deputy Chairman); Sir Stewart Duke-Elder, Messrs. Rugg-Gunn, Wolff, Cardell, Savin, Tudor Thomas, Foster, Iles, Professor Riddell, Miss Ida Mann, and Drs. Souter, Traquair, Moodie, Wheeler, Arkle, Hird, de Courcy, Ferguson, and Wharton. The Draft Memorandum was in due course considered by the full Council and in its amended form was submitted to the Ministry of Health Committee.

In response to a request for liaison with the Association of British Ophthalmologists, the Association was asked to appoint a representative on the Council. Mr. George Black was appointed.

A sub-committee has been set up to consider the Draft Articles of Association of the British Orthoptic Society, and to report to the Council, with the following constitution: Mr. J. D. M. Cardell (Chairman), Air Commodore P. C. Livingston, Mr. Macky, and Mr. Law (Convener).

The Industrial Supplies Department of the Board of Trade has been requested to release Maddox Eye Warmers and Optotherms from control of Supply.

With a view to easing the situation with regard to supply of spectacle lenses, a letter suggesting simplification of prescriptions written by civilian ophthalmic surgeons was inserted in the Medical Press and also sent to the N.O.T.B.

A Sub-Committee has been set up to consider the advisability of enlarging the scope and widening the activities of the Council of British Ophthalmologists, and to make concrete proposals to the Council. The following were nominated: Mr. McMullen (Chairman), Mr. Affleck Greeves, Sir Stewart Duke-Elder, Professor Riddell, Mr. G. Black and Miss Mann (Convener and Secretary).

The expenses of the Council have been met out of the funds in the hands of the Honorary Treasurer.

ABSTRACTS

MISCELLANEOUS

(1) **Sullmann, H. and Schmid, A. E. (Basle).—The oxydo-reduction system of the retina. (Ueber die Oxydoreduktions-systeme der Netzhaut).** *Ophthalmologica*, Vol. CIII, p. 151, March, 1942.

(1) This paper by **Sullman** and **Schmid** is a first instalment dealing with ascorbic acid and glutathione. It reports quantitative investigations on the ascorbic acid content of the retina of cattle and calves. In addition the variation of ascorbic acid content on exposure to light has been studied in living calves and rabbits and in enucleated eyes of cattle. Little variation was found and the experiments did not allow any definite conclusions to be drawn on the importance of ascorbic acid for the adaptation process in the retina. Protein free retina extracts show a positive reaction with sodium nitroprusside; the retina therefore contains SH compounds.

ARNOLD SORSBY.

(2) **Tschetschik-Kunina, E. A. (Moscow).—Keroplasty in serpignous ulcer of the cornea and allied conditions. (Keroplastik beim Ulcus Corneae serpens und anderen Geschwüren der Hornhaut).** *Ophthalmologica*, Vol. CIII, p. 1, January, 1942.

(2) **Tschetschik-Kunina** reports experimental observations on rabbits in which infected corneal ulcers responded satisfactorily to penetrating keratoplasty—a procedure reported clinically by previous observers, such as Löhlein and Nizetic. In the present series 15 patients with ulcus serpens were treated in this manner. In 11 cases the eye was retained, with useful vision in five of these. A comparison is given with 19 similar cases treated by trephining, which may be regarded as a modification of the Saemisch section (on the Continent this procedure has been advocated by Sondermann; in this country it has been practised independently by T. W. Letchworth with satisfactory results). Keratoplasty appears to give better results than trephine.

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(3) **Huysmans, J. H. B. and Fischer, F. P. (Utrecht).—The causes of high Vitamin C concentration of the aqueous and lens. (Ueber die Ursachen der hohen Vitamin-C-Konzentration von Kammerwasser und Linse).** *Ophthalmologica*, Vol. CIII, p. 21, January, 1942.

(3) **Huysmans** and **Fischer** find that vitamin C is almost always present in reduced form in the blood; adrenalin decreases the value

of the aqueous vitamin C by oxydation (and not by rendering the blood aqueous barrier impermeable), while atropine increases the aqueous value. In the aphakic eye, the aqueous value is nearly equal to that of the blood, it may be kept up by the vitamin C production of newly formed lens elements. In the case of cataract the aqueous content and the lens content of vitamin C is dependent on the degree of the opaqueness of the lens; it can remain normal only in nuclear cataract with functioning cortex. The lens can not only produce vitamin C but also reduce large quantities of oxidised vitamin C. It is shown that there is an external circulation of aqueous into the lens, whereby, the vitamin C is continually reduced and also a circulation within the lens with the same effect. These circulations are important sources of energy and prove that the vitamin C in the lens and aqueous functions as an energising reversible oxido-reduction system, a view formerly held but not previously shown experimentally.

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(4) **Coppez, H. (Brussels).—Treatment of hysterical lesions by shock therapy. (Traitement des accidents hysteriques par la convulso-thérapie).** *Ophthalmologica*, Vol. CII, p. 1, July, 1941.

(4) **Coppez** reports a case of bilateral hysterical blindness cured by convulsions induced by cardiazol. The healing mechanism is not to be explained by the feelings of fear and of death set up by the injection of pentamethylentetrazol but by the release of the blocking of the intracortical association paths, as seen from the electro-encephalograms, as also by the severe disturbances of the cerebral circulation shown by the measurement of the retinal pressure.

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(5) **Appélmans, M. and Van Horenbeeck, A. (Louvain).—The nature of uveo-parotid fever. (Sur l'origine de la fievre uvéo-parotidienne).** *Ophthalmologica*, Vol. CII, p. 65, August, 1941.

(5) **Appelmans** and **Van Horenbeeck** describe the case of a girl, aged 16 years, affected with uveo-parotiditis. In addition to the characteristic clinical picture there were also present small nodules in the conjunctiva, cornea and lacrymal gland. Histologically these nodules were similar in structure to the sarcoid nodules seen in Schaumann's tissues. Injection of the blood of the patient into six guinea pigs gave positive results in one. After three weeks there were general symptoms and an inflammatory reaction in the left salivary gland. The pus of this abscess was sterile and the animal died. This pus, injected into four guinea pigs, produced a

similar abscess in two after 15 days. The animals survived. The authors conclude that the affection is organismal in origin, the organism being present in the blood at the height of the fever period.

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(6) **Goldmann, H. (Berne).—Method for determining the volume of the anterior chamber in the living eye. (Eine Methode zur Volumbestimmung der Vorderkammer des lebenden Menschen).** *Ophthalmologica*, Vol. CII, p. 7, July, 1941.

Heim, M. (Berne).—Photographic determination of the depth and volume of the human anterior chamber. (Photographische Bestimmung der Tiefe und des Volumens der menschlichen Vorderkammer). *Ophthalmologica*, Vol. CII, p. 193, October, 1941.

(6) By using photographic apparatus attached to the slit-lamp Goldmann obtains photographic records of transverse sections of the anterior chamber. From these the volume can be computed mathematically by the procedure described in detail.

Heim's paper gives details of the application of Goldmann's technique and gives a record of 107 examinations and computations. The transverse section of the anterior chamber is considered as a rotation body and the volume calculated by a graphic integration process. The mathematical principles and the graphs for calculating the values are given. A calculation of the error of the individual photographs gave relatively small differences. After discussing variations with age and the influence of medicaments, a simplifying formula is given, whereby from two values (chamber, depth and distance of optical axis from the chamber angle) found by optical methods, the chamber volume can be obtained in a simple manner. The volume values found by photographic methods vary between 60 and 363 c.mm. Right and left eye by 9 persons showed the same volume. Average value: 194 ± 66 c.mm. Correlation coefficient with age between 20 and 70 years: 0·68 ± 0·046. The decrease in the average values with age is not lineal, but after the 50th year there is a steep fall.

ARNOLD SORSBY.

BOOK NOTICES

The Ophthalmic Prescriber's Codex. By FRANCIS E. PRESTON, D.O.M.S. Pp. 176. London: H. K. Lewis & Co., Limited. 1943.

This little book will serve a useful purpose; there is nothing exactly like it in the literature of the speciality known to the

reviewer. It is divided into three sections; the first devoted to formulas, the second to abridged treatment, and the third to miscellaneous subjects, which last includes a section on dangerous drugs; weights and measures; solubilities; vitamin contents of various foods; doses; idiosyncrasies and incompatibilities; local anaesthetics; abbreviations and glossary; normal values for C.S.F. and blood, and bacteriology; sulphonamides; and electro-therapeutic adjuvants.

The author has invoked the help of many specialists in various departments, and it is evident that the sections have been carefully scrutinised. That on formulas is excellent, but the value or even advisability of the section on treatment is less certain. The author discusses the treatment of a vast number of conditions, arranged alphabetically, in 64 pages, and it is unavoidable in these circumstances that many dogmatic statements are made on subjects some of which will be considered controversial. In the third part the factual statements are well arranged and will be of great value; some of the abbreviations, however, are by no means in common use, and their employment would cause confusion. On page 170 the author uses the term lachrymo-cystitis, which is unknown to the reviewer, and moreover does not appear in his glossary. Glaucoma receives incidental mention in the section on electrical treatment, but does not appear in the list of diseases amenable to adjuvant treatment of this kind, whereas many would affirm that it should head the list, in which one is also surprised to find ptosis. The index is very full.

One cannot but feel that this book will be more valuable and less dangerous in the hands of the expert ophthalmologist than in those of one whose knowledge will not permit of a critical appraisement and application.

CORRESPONDENCE

SYMPATHETIC OPHTHALMITIS

To the Editors of THE BRITISH JOURNAL OF OPHTHALMOLOGY.

DEAR SIRS,—I must first apologise to Mr. Humphrey Neame for my delay in replying to his criticism of my case of sympathetic ophthalmitis. I have been trying to obtain some more information about the exact nature of the inflammation. I feel very gratified that Mr. Neame has suggested that the case was one of ordinary cyclitis. For a long time I tried to take this view, but ultimately I

came to the conclusion that the clinical nature of the inflammation was that of sympathetic cyclitis. I should like to think that Mr. Neame is right and that I was not to blame for retaining the exciting eye too long. I regret that as far as I can ascertain the exciting eye was not examined histologically. We have no pathological department at The West Bromwich Hospital, and send our eyes to The Birmingham Eye Hospital. I froze this eye and bisected it. It was obvious that the lens had been incompletely removed, but I noticed no thickening of the choroid or any other appearance to suggest that the inflammation was not of the ordinary type. The specimen ought to have gone to Birmingham for examination, but apparently was never sent there. My only excuse is that I am quite single-handed in my work at this Hospital, and often have to work under high pressure. Again thanking Mr. Neame for his helpful and comforting suggestions.

I am, Sirs,

Yours faithfully,

T. HARRISON BUTLER.

HAMPTON-IN-ARDEN,
WARWICKSHIRE.

OPTIC NERVE INVOLVEMENT IN HEAD INJURIES

To the Editors of THE BRITISH JOURNAL OF OPHTHALMOLOGY.

DEAR SIRS,—With regard to Mr. F. C. Rodger's interesting paper in your January number, on "Unilateral Involvement of the Optic Nerve in Head Injuries," he mentions that the subsequent narrowing of the arteries on and pallor of the disc, and the degeneration of the nerve fibres *below* the injury, are not understood.

May I suggest as a possible cause in some cases, an interference with the vascular supply of the disc and the ganglion nerve-fibre layer of the retina, due to involvement of the ophthalmic artery or its first branch, the central artery of the retina, in the injury to the canal.

Yours truly,

ROSA FORD.

88, HARLEY STREET, W.1
April 17, 1943.

THE COUNCIL OF BRITISH OPHTHALMOLOGISTS

To the Editors of THE BRITISH JOURNAL OF OPHTHALMOLOGY.

DEAR SIRS,—The Council desire me to call attention to the paragraph in the Annual Report (a copy of which appears in this issue of your Journal) which states that "A Sub-Committee has been set up to consider the advisability of enlarging the scope and widening the activities of the Council of British Ophthalmologists, and to make concrete proposals to the Council."

This paragraph excited considerable interest and discussion at the Annual Meeting held on May 1, and it was thought that others not present at that Meeting might wish to express their views and to make suggestions. I am directed to request that any such should communicate at once with the Convener and Secretary:

MISS IDA MANN, F.R.C.S.,
The Nuffield Laboratory of Ophthalmology,
The Eye Hospital, Walton Street, Oxford.

It is proposed that the Sub-Committee's Report be considered at a special Meeting to be called before the next Annual Meeting, possibly at the time of this year's Oxford Congress in July.

I have the honour to be, Sirs,

Your obedient Servant,

FRANK W. LAW,
Hon Secretary.

36, DEVONSHIRE PLACE,
LONDON, W.1
May 6, 1943.

OBITUARY

LUTHER PETER

DR. LUTHER PETER died recently at the age of 73 as the result of an impaction of a gallstone in the common bile duct. He was well known to British ophthalmologists by his disquisitions on perimetry and on squint at the Oxford Congresses of 1920 and 1932, and to those who attended the International Congress of Ophthalmology at Washington in 1922 as its Secretary.

Peter's earliest interest was in neurology, from which he gravitated into ophthalmology, in which branch of medicine and surgery he

had held professional posts at the University of Pennsylvania. He was President of the American Academy of Ophthalmology and Oto-laryngology in 1928.

His book on perimetry appeared in four editions and that on the extra-ocular muscles in two editions. His widow survives him.

A. F. MACCALLAN.

NOTES

Death

AS we go to press, we learn with very great regret of the death of Mr. Leslie Paton. A full notice will appear in our next number.

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***Post-graduate Lectures in Ophthalmology at Glasgow**

THE following lectures have been arranged in the Department of Ophthalmology, University of Glasgow.

May 5, Dr. A. GARROW.—"The problem of the young myope."

May 12, Dr. C. W. GRAHAM.—"Ophthalmic experiences in the Middle East.

May 19, Dr. JAMES HILL.—"Observation on ocular tumours."

May 26, Dr. GEORGE BELL.—"The visual physiology of the cinema."

June 2, Dr. I. S. MACGREGOR.—"Toxic blindness."

* We regret that this note reached us too late for inclusion last month—EDITORS.

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Royal Society of Medicine

THE last meeting of the Section of Ophthalmology during the session 1942-43 will be held as follows:—

Friday, June 11, at 4.30 p.m., Cases.

At 5 p.m., Lieut.-Col. Derrick Vail, U.S.A., M.C., paper on "choroido-retinitis associated with toxo-plasma."

The annual business meeting will follow the paper.

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Special Notice

WE are asked by the Ministry of Information to state that the fact that goods made of raw materials in short supply owing to war conditions are advertised in this journal should not be taken as an indication that they are necessarily available for export.